

Intercuneiform Instability and the "Gap" Sign

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ABSTRACT

We describe three cases of low-energy injuries to the midfoot resulting in rupture of Lisfranc's ligament without tarsometatarsal injury. Examination of the feet revealed an obvious physical sign only on weightbearing, and all three patients were noted at surgery to have intercuneiform instability in association with a rupture of Lisfranc's ligament.

INTRODUCTION

Subtle injuries of the tarsometatarsal joint complex are notoriously difficult to diagnose both clinically and radiographically. Athletes seem to be prone to such injuries,⁴ and a failure to make the diagnosis can result in considerable morbidity. The plantar ecchymosis sign⁶ and radiographic criteria have been defined to help facilitate diagnosis.^{2,3} Significant injuries to this part of the foot are difficult to detect.

In this article, we detail three cases of a midfoot injury in which low-energy trauma resulted in disruption of Lisfranc's ligament and an unstable joint between the medial and intermediate cuneiform bones. In all three cases, we noted an obvious gap between the first and second toes of only the affected foot, which occurred during weightbearing. Radiographs revealed no recognized abnormality of the tarsometatarsal joints, but there was slight widening of the intercuneiform joint.

CASE REPORTS

Case 1

A 16-year-old female dancer was on full pointe when she heard a snapping sound and experienced sudden pain in her right forefoot. The patient noticed that she had acquired a gap between her first and second toes, but the significance of this was not ap-

preciated and nonweightbearing radiographs were reported as normal. After 2 weeks, she was able to walk unaided, but she experienced pain afterward. She was not able to dance. She presented to us 11 months after the injury, with no significant improvement. The most striking abnormality was the obvious gap between the first and second toes (Fig. 1). There was no loss of the longitudinal arch, and weightbearing radiographs revealed no recognized abnormality. There was slight widening of the joint between the medial and intermediate cuneiform bones (Fig. 2).

She underwent surgery at the site of instability of the intercuneiform joint and disruption of Lisfranc's ligament. Scar tissue was excised from the intercuneiform joint, and arthrodesis was performed (Fig. 3) through a dorsal incision. Screws were inserted from the medial cuneiform to the base of the second metatarsal and the intermediate cuneiform percutaneously under control of an image intensifier. The cast was removed after 10 weeks. On weightbearing, there was no longer a gap between the hallux and the second toe (Fig. 4).

Case 2

A 27-year-old solicitor presented 4 months after sustaining an injury while playing soccer. During the toe-off phase of running, he felt a sudden pain and was unable to continue playing. Apart from mild swelling, there was no deformity; after a week's rest, he was able to walk but could not run. Nonweightbearing radiographs at the time were normal, and a bone scan was reported as showing a stress fracture of the cuneiform. He, too, had noticed the appearance of a gap between his first and second toes immediately after the injury (Fig. 5).

Weightbearing radiographs showed minimal widening between the medial and intermediate cuneiform bones and at surgery it was noted that he had sustained an injury identical to that seen in case 1. In view of the fact that his injury was only 4 months old, we elected to reduce and hold the joints rather than perform an arthrodesis on them. Four months after surgery, the screws were removed. He no longer has a

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Fig. 1. Obvious gap sign in the right foot of a 16-year-old dancer.

visible gap between the toes (Fig. 6) and is pursuing a career as a ski instructor.

Case 3

A 39-year-old woman presented to us 2 months after sustaining a twisting injury of her midfoot and ankle while playing squash. Clinical and radiographic examinations of the foot at the time of injury failed to detect a significant injury. Despite intensive physiotherapy, she was unable to resume running. Weight-bearing radiographs and a CT scan (which is a non-weightbearing investigation) were difficult to interpret.

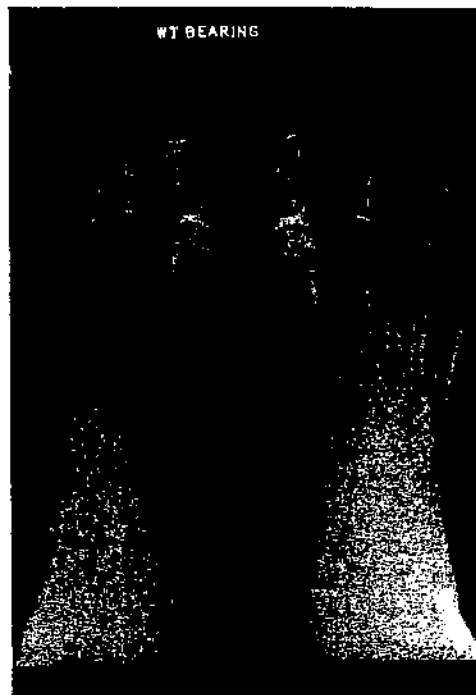


Fig. 2. AP radiograph demonstrating slight widening of the joint between the medial and intermediate cuneiform bones. Note that the tarsometatarsal joints are normal.



Fig. 3. Radiograph of the foot showing arthrodesis of the intercuneiform joint.

She did, however, demonstrate an obvious "gap" sign on weightbearing, although she had not noticed this. On the basis of this finding, her inability to run, and the similarity to the two cases previously described, surgery was advised and undertaken. This revealed similar findings as in the previous two cases. Reduction of the joints was carried out, and temporary fixation with screws was used. With this procedure, the gap has closed.

DISCUSSION

Rupture of Lisfranc's ligament without fracture of the second metatarsal base and association with in-

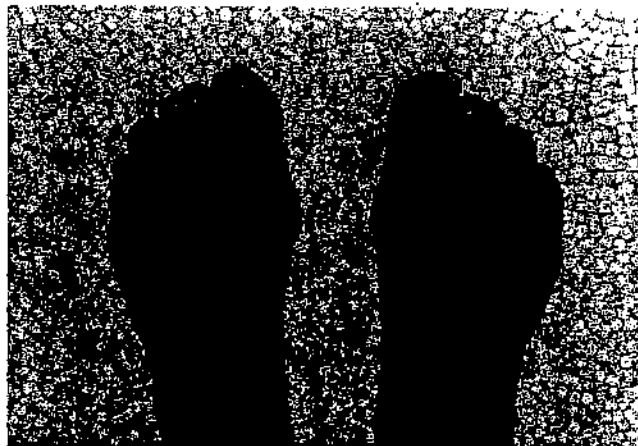


Fig. 4. Postoperative appearance of case 1, demonstrating closure of the gap.

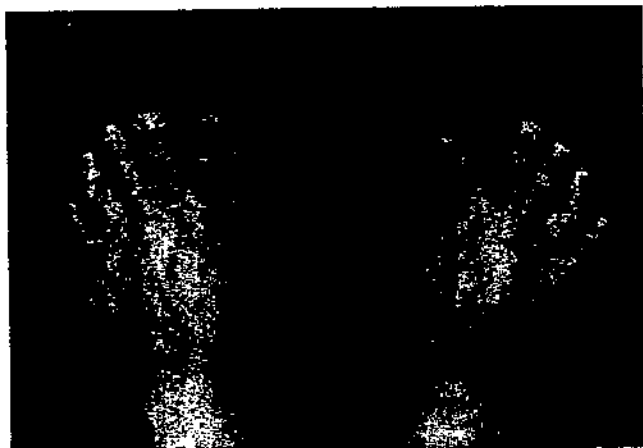


Fig. 5. Obvious gap in the right foot of a 27-year-old solicitor.

tercuneiform instability or diastasis is a rare injury.^{5,7} To our knowledge, the physical findings of the gap sign in association with this pattern of injury has not previously been recorded. We believe that this is an important sign to elicit if present, as it is diagnostic of this pattern of injury, is present immediately after injury, and does not resolve with time. It helped us to make the diagnosis in case 3, in which all other signs and investigations were inconclusive.

In the group we studied, the gap sign was the clearest objective indication of significant injury to the joint. We cannot comment on the reliability of the plantar ecchymosis sign⁶ because we saw none of these patients in the acute phase and no mention of its presence was made in their medical history. Other physical signs, such as swelling and tenderness of the joint, did not help to distinguish between a stable sprain of the joint and a more serious injury. These tests, therefore, are of limited value unless they are associated with obvious instability.

The radiological signs of a Lisfranc-type injury were

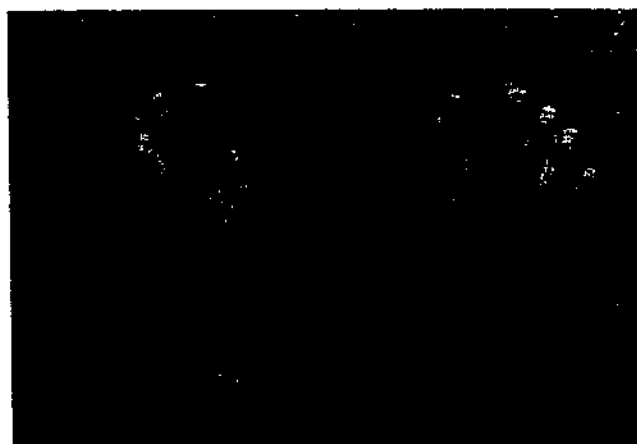


Fig. 6. Postoperative appearance of case 2 demonstrating closure of the gap.

not just equivocal, they were absent. The observation was made in 1976 that a step off at the base of the second metatarsal and the intermediate cuneiform was the most reliable radiological indicator of a tarsometatarsal injury.³ Flattening of the medial longitudinal arch, as seen with some tarsometatarsal injuries, is seen on lateral weightbearing radiographs as an overlap of the fifth metatarsal and the medial cuneiform.² The reason for the absence of these recognized radiological signs in the group we studied is that the pattern of injury we described is not strictly a tarsometatarsal (Lisfranc type), because neither the first nor the second tarsometatarsal articulation is in any way disrupted. Therefore, there is no flattening of the medial longitudinal arch.

Isolated injuries to the intercuneiform joints are rare.^{5,7} There is one report of two cases of intercuneiform dislocation,¹ but both of those patients were involved in very high-energy injuries and had significant disruptions of the midfoot as part of the injury complex. All three patients in this study sustained low-energy injuries, which resulted in widening of the intercuneiform joint with disruption of Lisfranc's ligament and the characteristic gap sign, without evidence of injury to the nearby tarsometatarsal joints. Presumably the low level of energy delivered to the foot at the time of injury allowed separation of the intercuneiform joint without disruption of other nearby joints.

We cannot tell how these patients would have fared in the long term because the natural history of this type of injury is uncertain. The two previous reports of this condition^{5,7} differ in their recommended treatment. The fact that the first case showed no symptomatic improvement almost 1 year after the injury leads us to suspect that the natural history of this condition is not always good in regard to the ability to return to sporting activities, as has previously been reported.⁷

We believe that this injury is not just a diastasis between the cuneiforms but a diastasis between the first and second rays. The gap between the toes is the result of this separation and not due to any problem at the metatarsophalangeal joint. To close the gap, it is necessary to reduce the diastasis between the medial and intermediate cuneiforms. The result of this is to narrow the foot and reduce the intermetatarsal angle between the first and second metatarsals.

CONCLUSION

If after an injury to the midfoot an individual demonstrates the gap sign on weightbearing, disruption of the intercuneiform joint should be suspected. For this

condition, we recommend surgery to correct the deformity in cases with persistent disability and significant diastasis.

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